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| Module designation | **Methods of Optimization** |
| Module level, if applicable | Master |
| Code, if applicable | M1. BM22 |
| Subtitle, if applicable | - |
| Courses, if applicable | **Methods of Optimization** |
| Semester(s) in which the module is taught | The first term**,** September-December, 18 weeks |
| Person responsible for the Module | Valery I. Reyzlin |
| Lecturer | Valery I. Reyzlin |
| Language | Russian |
| Relation to curriculum | Obligatory course in fundamental cycle |
| Type of teaching, contact hours | Lectures 16<br>Labs 32<br>TOTAL 48 |
| Workload | Contact hours 48<br>Self study 60<br>TOTAL 108 |
| Credit points | 3 ECTS |
| Recommended prerequisites | Information Systems and Technologies<br>Informatics<br>Mathematics |
| Module objectives/intended learning outcomes | To learn numeric methods of optimization; acquire skills of work in modern integrated programming systems to realize numeric methods of optimization; encourage students' motivation to self-learning by intensifying self-cognitive activity to study certain topics of the module and fulfill standard tasks.<br>By the end of the course the students will **know**:<br>- numerical methods of continuous optimization:<br>- fundamental methods of continuous optimization;<br>- implementation of optimization algorithms with the help of a computer;<br>- Mathematical methods of analysis of the simplest systems in science, economics and engineering.<br>The students will **be able** to:<br>- apply numeric methods for solving practical tasks;<br>- set an optimization task and develop an algorithm to solve it;<br>- use applied programming systems to solve optimization tasks.<br>The students will **have the experience** in:<br>- developing and debugging programs for solving tasks of continuous optimization. |

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| Content, hours | **Topic 1** Introduction to Methods of Optimization (lectures 2/labs 2)<br>**Topic 2** One-dimensional optimization (lectures 2/labs 4)<br>**Topic 3** Multi-dimensional unconditional optimization (lectures 4 /labs 4)<br>**Topic 4** Conditional optimization (lectures 4/labs 2)<br>**Topic 5** Random search method (lectures 2/labs 2)<br>**Topic 6** Linear programming (lectures 2/labs 2) |
| Assessment, forms of examination | **Progress**<br>  - T1: assessing labs 1-3<br>  - T2: assessing labs 4-6<br>**Final**<br>  - Exam: oral<br>During the term the total assessment is calculated by the formula:<br>$0.3 \cdot T1 + 0.3 \cdot T2 + 0.4 \cdot Exam$ |
| Reading list | Compulsory<br>1. Reyzlin, V.I. Numeric Methods of Optimization. Tomsk: TPU, 2013. – 112 p. (in Russian)<br>2. Jorge Nocedal Stephen J. Wright. Numerical Optimization, Second Edition. 2006 Springer Science+Business Media, LLC., 685 p.<br>3. Bahvalov, N.S. Numeric Methods. Moscow: Nauka, 1997. (in Russian)<br>4. Kalitkin, N.N. Numeric Methods. Moscow: Nauka, 1991. (in Russian)<br>Further reading<br>5. Rekleitis, G. & Rayvindran, A., Raksdel, K. Engineering Optimization. Methods and Applications. Books 1-2, Moscow: Mir, 1986. (Translation from English)<br>6. Atmanov, S.A. Linear Programming. Moscow: Nauka, 1981. (in Russian)<br>Software and Internet resources<br>7. Windows Vista, Windows 7 Corporative<br>8. Visual Studio 2010, Borland C++Builder for Microsoft Windows Version 10 (Turbo C++)<br>9. Reyzlin, V.I. Optimization Methods. E-Book, Tomsk, TPU, http://109.123.146.125/<br>10. NEOS Wiki – e-resource, http://wiki.mcs.anl.gov/NEOS/index.php/NEOS_Wiki Optimization -From Wikipedia: http://en.wikipedia.org/wiki/Optimization_(mathematics) |